REMARKS

Claims 1-11, 13-14 and 17-20 are pending in the above-captioned application, with claims 2-9, 11, 13, 14 and 17-20 rejected under 35 U.S.C. §112, all claims rejected under 35 U.S.C. §103(a), and all claims also being provisionally rejected under the doctrine of obviousness-type double patenting. Claims 2-7, 9, 11, 13, 14 and 17-19 have been amended herein in order to more clearly define and fully protect Applicant's invention. Reconsideration and allowance of all claims 1-11, 13-14 and 17-20 is respectfully requested.

Rejections Under 35 U.S.C. §112

Claims 2-9, 11, 13, 14 and 17-20 stand rejected under 35 U.S.C. §112, it being asserted that the use of the terms "graphite material" and "second flexible graphite sheet" are indefinite or lack antecedent basis given previous amendments made to the claims. Although Applicants assert that, when read in light of the specification, the objected-to terms are fully defined and supported, claims 2-7, 9, 11, 13, 14 and 17-19 have been amended herein to more clearly define the claimed graphite sheets.

In addition, claims 13, 14, 17 and 18 are also rejected as having improper dependency given the previous cancellation of claim 12. The dependency of these claims has been corrected by the current amendment.

Accordingly, all rejections under 35 U.S.C. §112 should be withdrawn as being moot.

Rejections Under 35 U.S.C. §103(a)

Claims 1-9, 11, 13, 14 and 17-20 stand rejected under 35 U.S.C. §103(a) over Dettling et al. in view of Chi and/or van Ommering and further in view of Mercuri et al. (U.S. 6,037,074).

Claim 10 stands rejected under 35 U.S.C. §103(a) over Dettling et al. in view of Chi and/or van Ommering and Mercuri et al. '074, and further in view of Edgington et al. (U.S. 5,589,301).

Claims 9 and 10 stand rejected under 35 U.S.C. §103(a) over Dettling et al. in view of Chi and/or van Ommering and Mercuri et al. '074, optionally in view of Edgington et al., and further in view of Selover, Jr. et al. (U.S. 4,014,730).

Claims 1-11, 13, 14 and 17-20 stand rejected under 35 U.S.C. §103(a) over Dettling et al. in view of Chi and/or van Ommering and further in view of Mercuri et al. (U.S. 6,432,336).

Claims 9 and 10 stand rejected under 35 U.S.C. §103(a) over Dettling et al. in view of Chi and/or van Ommering and Mercuri et al. '336, and further in view of Selover, Jr. et al.

The above-captioned application provides a cost effective process for manufacturing plates readily joined as bipolar plates, and which are useful in conventional and in liquid cooled fuel cell systems. Based upon the comments of the Office Action, the understanding of plates and bipolar plates differs. A flexible graphite or impregnated flexible graphite (FG) plate is an impervious structure, that is to say hydrogen, air or water will not penetrate the plate in the through thickness direction. The face of the plate adjacent the membrane electrode assembly is "with grooves" (the purpose of which is to direct the flow of the reacting gases) and the backside of an un-cooled plate is flat. For production, it is often most cost effective to manufacture only one side "with grooves" and subsequently put two plates back-to-back, distributing hydrogen on one side and the fuel oxidant on the other. The only reason to assemble two plates together – making a bipolar plate - would be to improve the electrical conductivity through the two. In rejected claim 1, the purpose of a tight fitting slightly malleable (as FG is) protrusion-recess joint between two plates forming a bipolar plate is to improve plate-to-plate electrical conductivity.

For high power density automotive fuel cell systems, a great deal of heat must be dissipated, several hundred watts (at full power) would not be unusual for each bipolar plate. For bipolar plates based on FG, every one is liquid cooled. In this construct adjacent plate faces are not flat but with grove (those used to appropriately direct liquid coolant) and thus the bipolar plate would be made using resin impregnated FG. Once joined with protrusion-recess, this bipolar plate is inseparable and sealed against liquid leakage in the direction parallel to the face of the plate (keeping in mind that each plate was initially impervious in the through thickness direction).

Dettling 4,732, 637 describes foraminous plates made impermeable in the through thickness direction in the process of assembling into the bipolar configuration. The theme is repeated many times in the teaching of the patent. In fact the "porous plates, col. 7, lines 23-25, are sealed along the edges so that the reactants cannot escape." "Porous plates are preferred" col. 8, line 43, for reasons which include circumventing groove blockage and so that the reacting gases can get to anyplace on the "lands" (the groove separations). Obviously the purpose does not inhibit flow in the direction parallel to the surface. Clearly the sealant layer (Claim 1, col. 10 lines 68-70, and col. 11 lines 1-5) is defined in a manner to fill the pores of the back sides of the individual plates without contribution to thickness of the assembly

"bonded so that they are in contact with one another in electroconductive registry."

Again, Dettling is not making bipolar plates from adequate plates; but, using the assembly process to give function (separate and direct the reactants) to plates that would otherwise be unusable in stacked configuration.

Chi 4,416,955 does not mention bipolar plates; the object of the invention is "to provide a fuel cell sub-assembly which is adapted to facilitate removal of such sub-assembly from others" column 1, lines 37-40. The Chi sub-assembly is defined as a "plurality of fuel cells" col. 2 line 25. A bipolar plate is in fact one half of the reactant delivery structure for two adjacent cells. The interlocking seals of Chi are not an attribute of cell construction but of "adjacent cooling plates" – one half of the cooling plate is on one side of a plurality of cells and the mating half on the other – the sub-assemblies are assembled one to another and it is in that regard that "the interface between the plates can be further facilitated by providing the cooling plates with male and female joints" col.3 lines 45-47. The reference has nothing to do with bipolar plates, which is demonstrated by an understanding of col. 2, line 66 through col. 3 line 47.

Van Ommering 4,565,749 describes a tongue and groove of a dielectric (plastic) frame to confine electrolyte, col. 3, 18-21, the bipolar aspect pertains only when "nickel metal tabs external to the frame" are welded together "following stack assembly," col. 6 lines 9-12.

As pointed out in the Office Action, interlock configurations are known in the bonding art; however, in the time span searched, > 25 years, none were used as solution to an existing problem such as described in the above-captioned application.

At the top of page 5 of the Office Action, the Action asserts that Dettling discloses porous carbon and includes several other specifically identified materials. In so doing, porous carbon is related to a compressed mass of expanded graphite. To those skilled in the art, porous carbon is defined as specific particle size aliquots of synthetic graphite bonded together with carbonized pitch or resins. (The Encyclopedia of Chemical Technology by Kirk and Othmer). The Dettling process is to convert two plates of porous materials which were otherwise unsatisfactory for use as plates in a fuel cell into a single bipolar plate made useable by two modifications: 1) a line of polymer saturant that prevented the reacting gases from mixing; and 2) by a peripheral coating that prevented the reacting gases from leaking out of the usable confine. Mercuri (6,037,074) discloses the art to form a polar plate –

his 25 U.S. patents in the field (and 25 more in related areas) demonstrate he is more than just "skilled in the art" and yet '074 was filed almost three years prior to the above-captioned application, an indication of the inventive effort necessary to define the invention, which provided significantly more than "only the expected result."

Typically the application claims are rejected on the basis of combining the teachings of several (3 or 4) references, only isolated instance ones of which are even arguably relevant, but stil not suggestive. On page 8, with respect to claim 10, the Action adds Edgington to (5,589,301) to the view. Edgington is of a web coating process pretty much out of the text books (both Kirk, and Shreve), the similarity is that there are several repeats where something is done and then the "web" is heated. It is unclear what this citation provides.

Selover 4,014,730 teaches what is <u>not</u> available - .3 mils of graphite foil- though it is claimed that it "readily available;" col. 1 line 65 - the thinnest foil available at the time of the Selover patent was 5 mils, about 20x claimed. Currently, the thinnest graphite foil available is 3 mils or 10 times what is claimed. Selover bonds two sheets of graphite together by hot pressing with a layer of elastomer that is preferentially vulcanized with times of 1 minute to 24 hours under pressure 15 to about 15,000 psi from

room temperature to 220°C. The above-captioned application relates to resins, not elastomers; the multifunctional systems are often cured at temperatures greater than 220°C and without load.

Although the Office Action takes up 20 pages of various combinations of the references applied, but none of the combinations, even if suggested, discloses or suggests the inventions of the rejected claims, i.e., the production of bipolar plates from useful monopolar plates.

Double Patenting

The claims of the above-captioned application also stand provisionally rejected under double patenting over copending applications 10/185,085 and 10/477,989. This cited applications each claim priority from the above-captioned application and will expire the same date (and certainly no earlier than) the above-captioned application does. Since, as established above, this application is now in condition for allowance, and will issue prior to the cited applications, the double patenting rejections of the claims of this application are moot and should be withdrawn.

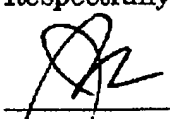
If at any time it is indicated that either of the cited applications will issues prior to the above-captioned application, a Terminal Disclaimer obviating this provisional rejection will be filed.

Conclusion

Based on the foregoing amendments and remarks, it is belied that all claims 1-11, 13-14 and 17-20 of the above-captioned application are not in condition for allowance. Such action is earnestly sought. If there remains any matter which prevents the allowance of any of these claims, the Examiner is requested to call the undersigned "collect" at 615.242.2400 to arrange for an interview which may expedite prosecution.

Applicants hereby petition to Commissioner for an extension of time of 2 months to respond to the outstanding Office Action, extending their time to respond to April 29, 2005. The Commissioner is authorized to charge the extension fee of $450, as well as any deficiency associated with the filing of this Response, to Deposit Account 50-1202.

Respectfully submitted,



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